from 0 to 30% by weight of one or more comonomers containing one or more ethylenic unsaturations, said comonomers being copolymerizable with the alkyl methacrylate.

Claim 14 (Amended). A panel according to claim 13 wherein the polymeric particle average sizes are in the range 0.1-200 micron, the amount is in the range 5-1000 ppm.

Claim 15 (Amended). A panel according to claim 1 wherein on the free surface of the composite base sheet parallel adhesive bands are present, having a width from 0.5 mm to 20 mm, placed at a distance the one from the other within the indicated limits, said distance being also greater than the band width.

REMARKS

Claims 1-16 were rejected. Claims 1, 3, 4, 6, 8, 9, 14 and 15 are amended. Support for the amendments can be found throughout the application, for instance in the specification including pages 5 (line 15) and 6 (lines 4 and 6) and in the claims as originally filed. No new matter is added. Applicants respectfully request reconsideration and withdrawal of all rejections.

Claim Rejections - 35 U.S.C. §112, Second Paragraph

Claims 1- 16 were rejected as being indefinite. Applicants respectfully submit that the rejection is moot in light of the claim amendments indicated herein. Applicants urge withdrawal of the rejection.

Claim Rejections - 35 U.S.C. §103

Claims 1-7, 12 and 16 were rejected under 35 U.S.C. §103(a) as being obvious over Kashima et al. (U.S. Patent No. 5,443,523). It was alleged that it would have been obvious to include the amount by weight and average particle size of barium sulphate as claimed because those of ordinary skill in the art would understand how to adjust the amounts and particle size of barium sulphate based on the amount of light desired to be diffused.

Applicants respectfully disagree. Applicants point out that the present invention addresses the technical problem of making available composite sheets or panels for luminous signs or displays, lit with one or more lamps sideways placed with respect to the sign or display, that allow for homogeneous lighting of the panel surface. The present invention is therefore directed to a thermoplastic composite panel, comprising a base transparent thermoplastic layer, conducting the light, having a thickness generally in the range 3-40 mm and a diffusing light layer, having a thickness in the range 10-1500 micron, placed on one or both surfaces of the base layer, said diffusing layer constituted by thermoplastic material containing barium sulphate in amount by weight, expressed as per cent ratio on the total weight of the diffusing layer, in the range 0.01-2%, the barium sulphate having average particle sizes in the range 0.1-50 micron, the composite sides being at least $\geq$ 10 cm, said composite having one or more edge lit, the composite area being greater than 100 cm^2.

As is clear from the various Examples of the application, barium sulphate is quite advantageous as compared to other inorganic powders (e.g., titanium dioxide) in achieving a uniform diffusion of light on the panel. For instance, Example 5 (comparative) discloses the preparation of a composite sheet comprising a sheet according to Example 2 (0.5%

barium sulphate), <u>but</u> with a diffusing layer containing 0.3% by weight of titanium oxide. A comparison of the diffused light intensity values on the surface of the plate at increasing distances from the source of light demonstrates the following. First, where the composite panel is lit by one source of light placed at one edge, in the composite of Example 5 (See Table 8 of Example 5a), light intensity decreases rapidly with the distance from the light source:

at 7 cm* : 52%
at 17 cm* : 14%
at 22 cm* : 10% * distance from the light source.

In contrast, in the composite panel according to the present invention (See Table 1 of Example 2a, Table 1 on page 13), light intensity decreases much more slowly with distance from the light source:

at 7 cm* : 86%
at 17 cm* : 63%
at 22 cm* : 53% * distance from the light source.

Second, where the composite panel is lit by two sources of light placed each at one opposite edge of the panel, in the composite of Example 5 (See Table 9 of Example 5b), light intensity decreases from the sources of light toward the center of the surface of the plate. The minimum value of diffused light intensity was found to be 62%. Yet, in the composite panel according to the present invention (See Table 1 of Example 2b) the diffused light intensity is constant, and above 100%, at any point of the panel surface.

Applicants also point out that the composite panel of the present invention is advantageous in that it can be prepared with known conventional processes (e.g., coextrusion, casting, compression molding, etc.), and thus its manufacture is both easy and inexpensive. For instance, the diffusing layer of the composite of Example 2a was

prepared by extruding on a conventional, monoscrew extruder equipped with degassing, with standard thermal profile for PMMA, a blend constituted for 99.5% of Altuglas® BS 9EL beads, produced by Atoglas and for 0.5% of Blanc Fixes® K3 powder produced by Sachtleben Chemie, containing 99% of BaS04 barium sulphate (See page 12, lines 2-8 of the specification). Applicants respectfully urge that no such invention is taught or suggested by the cited reference.

In contrast to the present invention, Kashima discloses a backlighting device for liquid crystal panels that illuminates transmissive or semi -transmissive panels from the rear side (col. 1, lines 6-8). Kashima is directed in particular to the technical problem of improving the efficiency of power to luminance conversion in such devices for liquid crystals (col. 1, lines 38-42). For instance, according to a first embodiment of the backlighting device, Kashima discloses (col. 1, line 63 to col. 2, line 14):

- a light conducting plate made of a light transmissive material, one of the major faces of the light conducting plate provided with a light diffusing capability (1 in Fig 3(b)).
- a specular or light diffusing/reflecting plate covering the major face of the light conducting plate (3 in Fig 3(b)).
- one sheet made of a light transmissive material having multiple raised structures, provided on the exit face of the light conducting plate (7 in Fig. 3(b) and col. 2, lines 4-11).
- a linear light source provided in proximity of the end portion of at least one side of the light conducting plate (col. 1, line 63 to col. 2, line 14).

In order to provide light diffusing capability to the light conducting plate (col. 3, lines 4-10), to part of the plate surface there is applied a light diffusing material (n.6 in Figs 3(b) and 4(b)).

In Kashima the diffusing material include paints and printing inks that contain titanium white, for example titanium dioxide, magnesium carbonate, barium sulfate (col. 3,

lines 9-10). The light diffusive materials are screen printed or otherwise printed in dots and strips on the surface of the light conducting plate (col. 3, lines 20-22). When imparting light diffusing quality, the density of the light diffusing areas (the number of dots per unit area) increases with the distance from the light source, Kashima clearly stating that this is preferred from the view point of a uniform luminance distribution (col. 3, lines 29-35). Indeed, Applicants point out that this embodiment is described in each of the examples of Kashima (See e.g., col. 8, lines 7-15). Applicants further point out that when as in comparative Example 7 (col. 12, lines 25-31) the coverage is held constant at 100% (i.e., uniform throughout the plate surface), there is produced an uneven luminance distribution on the plate.

Applicants therefore respectfully point out that the present invention includes a light diffusing thermoplastic sheet containing from 0.01 to 2% by weight of barium sulfate rather than a screen printed diffusing area of density increasing from the light source. Applicants respectfully submit that screen printing the diffusive material in the form of dots and strips on a light conducting plate is no teaching or suggestion of applying to a light conducting plate a light diffusing thermoplastic sheet according to the present invention. Indeed, in Kashima when there is a uniform coverage on the light conducting plate with the paints and printing inks (Example 7 comparative), an uneven luminance distribution is produced (col. 12, line 31). Moreover, whereas in Kashima barium sulfate or titanium oxide may be indifferently used, as in the examples where the latter is used throughout (See e.g., col. 10, lines 8-9), when applying to the light conducting plate a light diffusing thermoplastic sheet, barium sulfate particles are advantageous as in the present invention. Indeed, Applicants have clearly demonstrated that barium sulfate provides for a better diffusion of light on the surface of the panel than titanium oxide, although using a sheet containing a lower wt % of

titanium oxide (Compare Example 2a to Example 5a (comparative); Example 2b to Example 5b (comparative)). Kashima simply contains no teaching or suggestion with respect to the use of barium sulphate rather than titanium dioxide in a light diffusing sheet of thermoplastic material (See page 2, lines 4-5 of the specification), much less the unexpected advantages associated with such use.

Applicants also emphasize, as noted above, that the teachings of Kashima are directed to a light diffusing material screen printed on a surface of the light conducting plate (col. 3, lines 20-21) in light diffusing areas, in such a way that the density of the areas increase with the distance from the light source (col. 3, lines 31-34). However, the diffusing sheet of the present invention is prepared by conventional manufacturing methods, as noted above, and it is known with such manufacturing methods that there is obtained a uniform distribution of the particles in the sheet. This is quite different from Kashima, which as noted uses a diffusing material applied by screen printing in order to have a variation of the density of the light diffusing areas. When the coverage with the light diffusing material is held constant in Kashima (Example 7; col. 12, lines 25-31), there is a very uneven luminance distribution. Accordingly, the light diffusing material of Kashima cannot be considered to teach or suggest much less be any equivalent of the light diffusing thermoplastic sheet of the present invention. Applicants also note that Kashima contains absolutely no indication of the quantities of the inorganic powders or pigments to be used therein, since Kashima is directed to the problem of improving the efficiency of power to luminance conversion in devices for liquid crystals, by using screen printing of a light diffusing material on part of the plate surface (col. 3, lines 5-13).

Applicants further point out that Kashima teaches a composite comprising also a light reflective layer together with the light diffusing material. Accordingly, it is even less

likely that one of ordinary skill in the art might arrive at the present invention since upon viewing the references there would be no teaching or suggestion of the following. First, substitution of the light diffusive material, screen printed on a part of the plate surface in the form of diffusing areas, said areas having increasing densities with the distance from the light source, with a sheet containing inorganic powder. Second, selecting barium sulphate rather than other inorganic powders (e.g., titanium oxide) for the sheet. Third, omission of the reflective layer. Applicants thus urge withdrawal of the rejection as Kashima simply does not teach or suggest the present invention much less the unexpected advantages associated with the present invention.

Claims 1-16 were rejected under 35 U.S.C. §103(a) as being obvious over Ishii et al. (U.S. Patent No. 5,710,856). It was alleged that the thickness of the diffusing light layer would have been obvious because discovering an optimum or workable range involves only routine skill in the art. It was also alleged that having one or more edge(s) lit is conventional in the art.

Applicants respectfully disagree. Applicants note that the present invention is discussed above. In contrast to the present invention, Ishi et al. discloses a light reflective sheet and a light reflector, wherein a protective layer is laminated on at least one portion of a porous resin sheet having a high light reflection efficiency (i.e., the light reflective sheet) to improve light resistance (col. 1, lines 7-12). With reference to Figures 1 and 2, the light reflective sheet consists of the following: a transparent light guide plate 4; a light reflecting layer 3, located beneath the transparent light reflecting layer, formed by a porous resin sheet 31 and a UV protecting layer 32; a light diffusing sheet 5 on the upper surface of the transparent light reflecting layer; and a lens sheet. The porous resin sheet, comprised in the light reflecting layer 3, includes a polyolefin and 100 to 300 parts by weight, with

respect to 100 parts by weight of the polyolefin resin, of a finely powdery inorganic filler (col. 4, lines 14-17). The light reflectance of the porous resin sheet at a wave length of 550 nm is of 95% or more (col. 4, line 20). A porous resin film is obtained by molding an unstretched film of resin, composition and then monoaxially or biaxially stretching the molded film (col. 7, lines 23-30). Ishi et al. discloses that the amount of the finely powdery inorganic filler to be added has an influence in the light reflectance of the obtained porous sheet (col. 8, line 28). Indeed, where the amount of finely powdery inorganic filler is small, the porosity of the obtained porous resin sheet is low. In such an instance the quantity of light, reflected on interfaces between resin layers and air layers decreases and a porous resin sheet having high light reflectance cannot be obtained.

Ishi et al. clearly does not teach or suggest the present invention. Indeed, as is quite clear, Ishi et al. actually teaches away from the present invention in that the reference teaches the application of a resin sheet, having a high light reflection efficiency, to a transparent light guide plate. However, in the present invention it is noted that a layer applied on a surface of the transparent thermoplastic base plate can improve light diffusion. Those of ordinary skill in the art viewing Ishi et al. simply would find no teaching or suggestion of the present invention much less the unexpected advantages of the present invention. Applicants also point out that the quantities of inorganic filler particles in the porous resin sheet of Ishi et al. are at least a hundred times higher than those used in the composite panel of the present invention. The composite of the present invention also does not contain any light reflecting layer. Accordingly, in that Ishi et al. does not teach or suggest the present invention and its unexpected advantages, Applicants urge withdrawal of the rejection.

In view of the amendments and remarks above, Applicants submit that this application is in condition for allowance and request reconsideration and favorable action thereon.

In view of the amendments and remarks above, Applicants submit that this application is in condition for allowance and requests reconsideration and favorable action thereon.

In the event this paper is not considered to be timely filed, Applicants hereby petition for an appropriate extension of time. The fee for this extension may be charged to our Deposit Account No. 01-2300, along with any other fees which may be required with respect to this application.

Respectfully submitted,

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Enclosures: Marked Up Copy of Claim Amendments
Petition for Extension of Time

MARKED UP COPY OF CLAIM AMENDMENTS

Claim 1 (Amended). A thermoplastic composite panel, comprising a base transparent thermoplastic layer, conducting the light, having a thickness generally in the range 3-40 mm [, preferably 6-25 mm] and a diffusing light layer, having a thickness [generally] in the range 10-1500 micron, [preferably 30-1000 micron,] placed on one or both surfaces of the base layer, said diffusing layer [being characterized in that it is] constituted by thermoplastic material containing barium sulphate in amount by weight, expressed as per cent ratio on the total weight of the diffusing layer, in the range 0.01-2%, [preferably 0.1-0.8%, still more preferably 0.1-0.6%,] the barium sulphate having average particle sizes in the range 0.1-50 micron, [preferably 0.5-10 micron,] the composite sides being at least $\geq$ 10 cm, [preferably in the range 20 cm-1m,] said composite having one or more edge lit, the composite area being greater than 100 cm^2 [, preferably greater than 600 cm^2].

Claim 3 (Amended). A panel according to claim 1, wherein [the] a source of the light is placed on two opposite edges.

Claim 4 (Amended). A panel according to claim 1, wherein the thermoplastic material of which the base layer and the diffusing layer containing barium sulphate are constituted, is selected from a (meth)acrylic (co)polymer, polycarbonate, polystyrene, PET, copolyesters constituted by glycol modified PET [such as for example] chosen from the group consisting of dietylenglycol, butandiol, hexandiol and 1, 4-cyclohexane dimethanol or mixtures of PET with [these] the copolymers.

Claim 6 (Amended). A panel according to claim 5 wherein the alkyl (meth)acrylate is selected from the compounds wherein the alkyl group has from 1 to 8 carbons [, such as methyl, ethyl, propyl, isopropyl and butyl (meth)acrylate].

Claim 8 (Amended). A panel according to claim 7 wherein the thermoplastic polymer is constituted by methylmethacrylate/alkyl acrylate copolymers [, preferably ethyl acrylate].

Claim 9 (Amended). A panel according to claim 5 wherein the (meth)acrylic thermoplastic (co)polymer comprises from 70 to 100% by weight of alkyl methacrylate and from 0 to 30% by weight [, preferably from 3 to 10% by weight,] of one or more comonomers containing one or more ethylenic unsaturations, said comonomers being copolymerizable with the alkyl methacrylate.

Claim 14 (Amended). A panel according to claim 13 wherein the polymeric particle average sizes are in the range 0.1-200 micron, [preferably 0.1-50 micron, more preferably 1-15 micron,] the amount is in the range 5-1000 ppm [, preferably 100-200 ppm].

Claim 15 (Amended). A panel according to claim 1 wherein on the free surface of the composite base sheet parallel adhesive bands are present, having a width [of some millimeters to some centimeters, preferably] from 0.5 mm to 20 mm, placed at a distance the one from the other [generally] within the indicated limits, said distance being also greater than the band width.